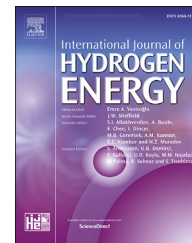




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Short Communication

The 10th international conference on “Photosynthesis and Hydrogen Energy Research for sustainability”: A pictorial report in honor of Tingyun Kuang, Anthony Larkum, Cesare Marchetti and Kimiyuki Satoh



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ABSTRACT

An international Conference «Photosynthesis and Hydrogen Energy Research for Sustainability» is a traditional event held in various countries of the world. We present here a pictorial report of the 10th Conference, held in St. Petersburg (Russia), during June 23–28, 2019, in honor of four distinguished international scientists: Tingyun Kuang (China), Anthony Larkum (Australia), Cesare Marchetti (Italy), and Kimiyuki Satoh (Japan). In the present news report, we provide a description of the conference, scientific program and special events, as well as a brief introduction and contributions of those honored. Special attention is given to the event that was organized for young researchers who were chosen for their outstanding research in the field of photosynthesis and hydrogen energy. Several photographs are included to show the excellent atmosphere of the 10th Conference.

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¹ Note: In the past, Govindjee has used one name only.

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Introduction

The current International Conference on «Photosynthesis and Hydrogen Energy Research for Sustainability – 2019» is the 10th in the series. This Conference, first organized in 2004, has had a positive dynamic of development, evoking an ever-growing interest among the global scientific community. Earlier conferences were held in Canada (2004), Russia (2006, 2014, and 2016), Azerbaijan (2011, 2013, 2018), Greece (2015) and India (2017) [1–6]. Our conference was held during June 23–28, 2019 in Saint Petersburg, which is one of the world's most northern cities with a population over 5 million. The major goal of our conference was a discussion of previous, present, and future research on photosynthesis and hydrogen energy, covering the breadth and depth of both topics, from fundamental and applied aspects of research to artificial photosynthesis and nanobiotechnology. The relevance of the research in the field of photosynthesis and associated hydrogen release in recent decades has been reinforced by the growing need for new sources of energy.

The official Conference organizers² from the Russian side were from the Institute of Basic Biological Problems of Russian Academy of Sciences (IBBP RAS), Russian Society for Photobiology (RSP) and Komarov Botanical Institute of the Russian Academy of Sciences (BIN RAS), and the conference was run by Monomax Company (Monomax PCO), a member of the International Congress Convention Association (ICCA).

Our 2019 conference took place at the Belosselsky Belozersky Palace with a Neo-Baroque style building (https://en.wikipedia.org/wiki/Beloselsky-Belozersky_Palace) having beautiful surroundings at the intersection of the Fontanka River and Nevsky Prospekt in Saint Petersburg, Russia.

We provide below a pictorial report of this conference. The opening ceremony of the conference was held on the 23rd of June; it began with the welcome address by Anatoly Tsygankov, Chairman of the Local Organizing Committee (Fig. 1A) followed by similar welcoming remarks by Julian Eaton-Rye, Secretary of the International Society of Photosynthesis Research (Fig. 1B), Dmitry Geltman, Director of BIN RAS (Fig. 1C), Suleyman Allakhverdiev, Coordinator of the Conference (Fig. 1D), and the co-chairs of the conference Maria Borisova-Mubarakshina (Fig. 1E) and Olga Voitsekhovskaja (Fig. 1F).

The first day of the conference was dedicated to the four honored scientists of the conference. Jian-Ren Shen introduced Kimiyuki Satoh and his research, which was followed by the plenary lecture by Kimiyuki Satoh “Sixty years since the death of Robert Emerson: History of uncovering the chemical entities”; this lecture included discussion of Satoh's own major discoveries. The next plenary lecture was “Photosynthesis Research in Tingyun Kuang's Laboratory, given by Guangye Han, a long-time collaborator of T. Kuang. Then, Govindjee not only

introduced Cesare Marchetti, but also gave, on his behalf, his plenary lecture on “Self sinking capsules, a final solution to radioactive disposal”. Lastly, Julian Eaton-Rye introduced Anthony (Tony) Larkum and his research, which was followed by the last plenary lecture by Anthony Larkum “Stromatolites old and new”. For a parallel News Report that includes a description of the research contributions of the four honored scientists, see Borisova-Mubarakshina et al. [7].

Tatsuya Tomo, Suleyman Allakhverdiev, and Julian Eaton-Rye organized the presentation of the wonderful “Outstanding Achievement Award” plaques as well as certificates to Tingyun Kuang, Anthony Larkum, Cesare Marchetti, and Kimiyuki Satoh, for their highly important and significant contributions (Figs. 2 and 3). These awards were also presented to Nathan Nelson (of Israel) and Nejat Veziroglu (of USA), two honored scientists of the International Conference «Photosynthesis and Hydrogen Energy Research for Sustainability–2016» (see [5]) since they had missed receiving them earlier.

“Get together evening” in the botanical garden and the excursion to the greenhouse in the botanical garden

After the gathering of all the participants at the entrance of the Beloselsky-Belozersky palace for a group photograph (Fig. 4), they were taken by buses to the “get together evening” at the BIN RAS (https://en.wikipedia.org/wiki/Komarov_Botanical_Institute). This “get together” was held in a luxurious setting in the Botanical Garden³, which was followed by an excursion to the Greenhouse of the Botanical Garden (tropical pathway and Victoria House).

The program of the conference

During the following three days of our conference, all the presentations were divided into two separate sessions: (1) Photosynthesis Research for Sustainability, devoted to studies of the structure, function and biogenesis of the photosynthetic apparatus; and (2) Hydrogen Energy Research for Sustainability, devoted to research on both biological hydrogen production and fuel cell production. Both the sessions included fundamental and applied aspects of research, as well as work in the field of artificial photosynthesis using nanomaterials and nanotechnologies. For the detailed program, see <https://icprs.ru/#/schedule>.

The “Photosynthesis” session (#1) included discussion on light-driven processes, regulation, and metabolism, as well as the sustainability of the photosynthetic apparatus to stress, under the following topics:

- (1) Primary Processes of Photosynthesis;
- (2) Structure, Function and Biogenesis of the Photosynthetic Apparatus;
- (3) Photosystem I and Bacterial Photosynthesis;
- (4) Photosystem II and Water Oxidation Mechanism;
- (5) Energy Transfer and

² Local Organizing and Program Committee: Chair: Anatoly Tsygankov; Co-chairs: Maria Borisova-Mubarakshina, and Olga Voitsekhovskaja; Members (in alphabetical order, by first names): Alexandra Murtuzova, Anna Stepanova, Anastasiia Evkaikina, Camilla Rabadanova, Daria Vetoshkina, Denis Yanykin, Elena Tyutereva, Ilya Naydov, Ksenia Chebotareva, Ksenia Dobryakova, Natalia Rudenko, and Valeriya Dmitrieva.

³ This Garden is one of the oldest botanical gardens in Russia; it is situated on Aptekarsky Island and has a very large and exotic outdoor and indoor plant collection. It covers an area of about 1 ha (10,000 square meter); it is one km long, and includes wonderful park areas and several greenhouses. There are about 10 thousand taxa, which include species from the most remote and exotic parts of the world.



Fig. 1 – Photographs from the opening ceremony of the 10th International Conference «Photosynthesis and Hydrogen Energy Research for Sustainability–2019» A – Anatoly Tsygankov; B – Julian Eaton-Rye; C – Dmitry Geltman; D – Suleyman Allakhverdiev, E – Maria Borisova-Mubarakshina; F – Olga Voitsekhovskaja. These and all other photographs in Fig. 2–5, 7 and 8 were taken and provided to us by Tatsuya Tomo.

Trapping in Photosystems; (6) Plant Development and Growth Regulation; (7) Carbon Fixation (C3 and C4) and Photorespiration; (8) Artificial and Applied aspects of Photosynthesis including Nanotechnology; (9) Regulation of Photosynthesis, ROS (Reactive Oxygen Species) production and Environmental Stress; (10) Systems Biology of Photosynthesis: Integration of Genomic, Proteomic, Metabolomic and Bioinformatic Studies; (11) Plant Mineral Nutrients and Photosynthetic Capacity; and (12) Photosynthesis Education and Emerging Techniques for Studying Photosynthesis including Neutron Scattering.

The “Hydrogen Energy” session (#2) included discussions on the recent advances in the study of the molecular basis of hydrogen formation under the following topics: (1) Energy for the Future – Hydrogen economy; (2) Elevating Climate Change; (3) Biological Hydrogen Production; (4) Hydrogenases; (5) Proton Reduction Catalysts; (6) Reduction of Carbon Dioxide; (7) Artificial Photosynthesis for Hydrogen energy; (8) Nanotechnology in Fuel Cells; (9) Nanomaterials for Hydrogen Production; and (10) Hydrogen Energy Education and Emerging Techniques for Studying of Hydrogen Energy.

The scientific program of the above two sessions included daily plenary lectures, oral and poster presentations by the conference participants, as well as selected presentations by young scientists.

During three days of the Conference, we had plenary lectures given by Jian-Ren Shen (Japan), Mahdi Najafpour (Iran), Tatsuya Tomo (Japan), Andrey Rubin (Russia), Sumanta Kumar Padhi (India), William Cramer (via Skype; USA), Matthias Rögner (Germany), Julian Eaton-Rye (New Zealand), Marc Nowaczyk (Germany), Nathan Nelson (Israel), Govindjee (USA), Anatoly Tsygankov (Russia), Giovanni Venturoli (Italy), Dmitry Dunikov (Russia), Mats Hansson (Sweden) and Giuseppe Spazzafumo (Italy). Further, selected participants gave 16 session talks in two parallel sections (see photographs of some of the speakers in Fig. 5).

Recognition of young scientists

For any conference, recognition of young scientists is extremely important for the future of our field. This took place on June 24, 2019, first with oral presentations by the following seven young scientists: Zahra Abdi (Water oxidation by Vitamin B12: Questions and challenges); Daisuke Takagi (Phosphorus toxicity decreases both electron sink activity and anti-oxidative activity in rice leaves); Eugene Maksimov (Temperature sensor derived from the photoactive Orange Carotenoid Protein); Valerya Dmitrieva (Photosynthesis controls plasmodesmata permeability in *Arabidopsis thaliana*); Sasan Aliniaiefard (γ -aminobutyric acid



Fig. 2 – Recognition of Kimiyuki Satoh and Tingyun Kuang, two of the honored scientists. A – Jian-Ren Shen introducing Kimiyuki Satoh; B – Kimiyuki Satoh and Julian Eaton-Rye (holding the award plaque and the certificate for Satoh); C – Guangye Han introducing, and speaking on behalf of T. Kuang; D – Guangye Han and Julian Eaton-Rye (with the award plaque and the certificate for Kuang).

confers cadmium tolerance in maize plants by concerted regulation of polyamine metabolism and the antioxidant defense system); Jack Forsman (Hydrophobic interactions between the D1 and PsbT subunits of Photosystem II stabilize the iron-quinone acceptor complex); and Kseniya Nikerova (Increase in the activity of AOS enzymes is an indicator of abnormal growth of woody plants, which differ in the heartwood/sapwood ratio).

Further, the organizing committee selected eleven young scientists (from the oral and poster presentations) for their outstanding research in the field of photosynthesis, hydrogen energy, plant biology, nanomaterials and nanotechnology research for sustainability. Fig. 6 shows the winners; they were: Aleksandr Ashikhmin (Russia), Camilla Rabaganova (Russia), Jack Forsman (New Zealand), Mahya Salmanion (Iran), Martina Beckova (Czech Republic), Maxim Kozlov (Russia), Miyuki Tanabe (Japan), Takagi Daisuke (Japan), Tirupathi Malavath (Israel), Volker Hartmann (Germany), and Zahra Abdi (Iran). All the eleven prizes were courtesy of Agrisera and Springer; the latter provided books from the “Advances in Photosynthesis and Respiration” series (Series editors: Thomas Sharkey & Julian Eaton-Rye; founding editor: Govindjee) and “Hydrogen Energy”; these books were signed by Suleyman Allahverdiev, Tatsuya Tomo, Julian Eaton-Rye and Govindjee, with best wishes for future research of the awardees.

Poster sessions

On June 24 and 25, 2019, after the oral presentations we had the poster sessions. We note that the number of the posters at the 10th International Conference had significantly increased from those in the previous years. Poster sessions were lively, and we observed that there were not only in-depth scientific discussions, but also a friendly atmosphere at these poster sessions (Fig. 7).

Banquet

At the end of our Conference, the participants were invited to a bright and memorable friendly party in one of the best restaurants in St. Petersburg “White Night Music Joint” that had live music. We note that this restaurant combines two great passions for those who live in St. Petersburg – which are a view of their beloved city and jazz⁴. Participants enjoyed not only informal discussions with their colleagues, but also a variety of delicious meals and drinks and pleasant music in jazz style.

⁴ In this restaurant, the concert of «Not jazz band» was organized with the elements of swing, hip-hop and neo-soul saturated with fresh sound popular music in their composition; this musical group from St. Petersburg is known for its unique arrangements.



Fig. 3 – Recognition of Cesare Marchetti and Anthony Larkum, the other two honored scientists (see Fig. 2). A – Govindjee introducing Cesare Marchetti and giving plenary lecture on his behalf; B – Marchetti and Julian Eaton-Rye (with the award plaque and the certificate for Marchetti); C – Eaton-Rye introducing Anthony (Tony) Larkum; D – Tony Larkum and Eaton-Rye (with the award plaque and the certificate for Larkum).



Fig. 4 – A group photograph of all the participants and the organizers of the 10th International Conference «Photosynthesis and Hydrogen Energy Research for Sustainability–2019» at the stairs of the Beloselsky-Belozersky palace. In the first row: from right to left: Suleyman Allakhverdiev; Julian Eaton-Rye; Cesare Marchetti; Antony (Tony) Larkum; Govindjee; and Jian-Ren Shen. On the extreme left in the second row is Maria Borisova-Mubarakshina; and on the extreme right in the third row is Anatoly Tsygankov.



Fig. 5 – Photographs of some of the speakers of the 10th International Conference “Photosynthesis and Hydrogen Energy Research for Sustainability–2019”: A – Kentaro Ifuku (Japan); B – Rachel Nechushtai (Israel); C – Maria Borisova-Mubarakshina (Russia); D – Mats Hansson (Sweden); E – Nathan Nelson (Israel); F – Natalia Rudenko (Russia); G – Giuseppe Spazzafumo (Italy); H – Vasily Ptushenko (Russia); I – Gregory Pozhvanov (Russia); J – Julian Eaton-Rye (New Zealand); K – Elena Tyutereva (Russia); L – Giovanni Venturoli (Italy).



Fig. 6 – Photographs of young scientists, winners of the best oral and poster presentations, receiving special certificates from Julian Eaton-Rye. A – Camilla Rabaganova, B – Takagi Daisuke, C – Tirupathi Malavath, D – Martina Beckova, E – Miyuki Tanabe, F – Zahra Abdi, G – Volker Hartmann, H – Mahya Salmanion, I – Maxim Kozlov, G – Jack Forsman. K – Aleksandr Ashikhmin. All the above photographs were taken and provided to us by Rie Nagayoshi.



Fig. 7 – Photographs from the poster sessions. The names of the authors of the posters presented here are: A – Vasily Terentyev; B – Hidetaka Koga; C – Tirupathi Malavath (standing with Rajagopal Subramanyam); D – Shunsuke Sone; E – Daria Vetoshkina; F – Alexandr Shitov (standing with Govindjee); G, H, and I – show randomly selected photographs from the poster sessions.



Fig. 8 – Randomly selected photographs of the participants in the conference hall. Some of the participants asking questions of speakers are also shown: Anastasia Petrova (A), Anthony Larkum (B), Imre Vass (C), Govindjee (G), Franz-Josef Schmitt (I), Marina Kozuleva (K), and Alexey Semenov (L).

Special thanks to the participants

We are highly thankful to all the participants for coming to Saint Petersburg and sharing the Event with us. Around 200 participants from all over the world (Armenia, Australia, Azerbaijan, United Kingdom, Hungary, Germany, Greece, Israel, India, Iran, Italy, China, New Zealand, Czech Republic, Japan, United States of America, Belarus, Estonia, Slovakia, Sweden, Finland and Kazakhstan) attended the 10th International Conference «Photosynthesis and Hydrogen Energy Research for Sustainability–2019». All the participants were extremely active and asked many interesting questions to the speakers (Fig. 8).

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Our very special thanks go to: (i) Agrisera Company for providing special prizes for young scientists, and for presenting an important lecture via Skype; (ii) International Society of Photosynthesis Research, which provided the wonderful award plaques to those we honored at this Conference; and (iii) Lab Instruments Company, the gold sponsor of the conference, for the oral presentation by Sergey Antsyovich about the company products and collaborations and for providing special financial support to our conference. Five of us (Borisova-Mubarakshina, Tsygankov, Tomo, Allakhverdiev and Govindjee) give very special thanks to our co-author Julian Eaton-Rye (Secretary, ISPR) for recognizing and presenting the award plaques to the honored scientists, and the award certificates to the selected young scientists.

Five of us (Borisova-Mubarakshina, Tsygankov, Allakhverdiev, Eaton-Rye and Govindjee) are grateful to our coauthor Tatsuya Tomo, as well as Rie Nagayoshi for the

photographs used in this paper: Tomo for Figs. 1–5, 7, 8; Nagayoshi for Fig. 6.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijhydene.2019.09.224>.

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